Claims:

1. A position sensor device for determining a position of a reciprocating object, comprising:

at least one magnetically encoded region fixed on a reciprocating object;

at least one magnetic field detector;

a position determining unit;

wherein the magnetic field detector is adapted to detect a signal generated by the magnetically encoded region when the magnetically encoded region reciprocating with the reciprocating object passes a surrounding area of the magnetic field detector;

wherein the position determining unit is adapted to determine a position of a reciprocating object based on the detected magnetic signal.

2. The position sensor device according to claim 1,
wherein the at least one magnetically encoded region is a permanent magnetic region.

3. The position sensor device according to claim 1 or 2,
wherein the at least one magnetically encoded region is a longitudinally magnetized region of the reciprocating object.

4. The position sensor device according to claim 1 or 2,
wherein the at least one magnetically encoded region is a circumferentially magnetized region of the reciprocating object.

5. The position sensor device according to any of claims 1, 2 or 4,

wherein the at least one magnetically encoded region is formed by a first magnetic flow region oriented in a first direction and by a second magnetic flow region oriented in a second direction, wherein the first direction is opposite to the second direction.

6. The position sensor device according to claim 5,
wherein, in a cross-sectional view of the reciprocating object, there is the first circular magnetic flow having the first direction and a first radius and the second circular magnetic flow having the second direction and a second radius, wherein the first radius is larger than the second radius.

7. The position sensor device according to claim 1,
wherein the at least one magnetically encoded region is manufactured in accordance with the following manufacturing steps:

applying a first current pulse to a magnetizable element;

wherein the first current pulse is applied such that there is a first current flow in a first direction along a longitudinal axis of the magnetizable element;

wherein the first current pulse is such that the application of the current pulse generates a magnetically encoded region in the magnetizable element.

8. The position sensor device according to claim 7,

wherein a second current pulse is applied to the magnetizable element;

wherein the second current pulse is applied such that there is a second current flow in a second direction along the longitudinal axis of the magnetizable element.

9. The position sensor device according to claim 8,

wherein each of the first and second current pulses has a raising edge and a falling edge;

wherein the raising edge is steeper than the falling edge.

10. The position sensor device according to claim 8 or 9,

wherein the first direction is opposite to the second direction.

11. The position sensor device according to one of claims 7 to 10,

wherein the magnetizable element has a circumferential surface surrounding a core region of the magnetizable element;

wherein the first current pulse is introduced into the magnetizable element at a first location at the circumferential surface such that there is the first current flow in the first direction in the core region of the magnetizable element; and

wherein the first current pulse is discharged from the magnetizable element at a second location at the circumferential surface;

wherein the second location is at a distance in the first direction from the first location.

12. The position sensor device according to one of claims 8 to 11,

wherein the second current pulse is introduced into the magnetizable element at the second location at the circumferential surface such that there is the second current flow in the second direction in the core region of the magnetizable element; and

wherein the second current pulse is discharged from the magnetizable element at the first location at the circumferential surface.

13. The position sensor device according to one of claims 7 to 12,

wherein the first current pulse is not applied to the magnetizable element at an end face of the magnetizable element.

14. The position sensor device according to any of claims 1 to 13, wherein the at least one magnetically encoded region is a magnetic element attached to the surface of the reciprocating object.

15. The position sensor device according to any of claims 1 to 14, wherein the at least one magnetic field detector comprises at least one of the group consisting of

a coil having a coil axis oriented essentially parallel to a reciprocating direction of the reciprocating object;

a coil having a coil axis oriented essentially perpendicular to a reciprocating direction of the reciprocating object;

a Hall-effect probe;

a Giant Magnetic Resonance magnetic field sensor; and

a Magnetic Resonance magnetic field sensor.

16. The position sensor device according to any of claims 1 to 15, comprising a plurality of magnetically encoded regions fixed on the reciprocating object.

17. The position sensor device according to claim 16, wherein the plurality of magnetically encoded regions are arranged on the reciprocating object at constant distances from one another.

18. The position sensor device according to claim 16, wherein the plurality of magnetically encoded regions are arranged on the reciprocating object at different distances from one another.

19. The position sensor device according to claim 18,

wherein the different distances are selected based on a linear function, a logarithmic function or a power function.

20. The position sensor device according to any of claims 16 to 19, wherein the plurality of magnetically encoded regions are arranged on the reciprocating object with constant dimensions.

21. The position sensor device according to any of claims 16 to 19, wherein the plurality of magnetically encoded regions are arranged on the reciprocating object with different dimensions.

22. The position sensor device according to any of claims 16 to 21, wherein different magnetically encoded regions are provided of different magnetic materials.

23. The position sensor device according to any of claims 16 to 22, wherein different magnetically encoded regions are provided with different values of magnetization.

24. The position sensor device according to any of claims 1 to 23, comprising a plurality of magnetic field detectors.

25. The position sensor device according to claim 24, wherein the plurality of magnetic field detectors are arranged along the reciprocating object at constant distances from one another.

26. The position sensor device according to claim 24,

wherein the plurality of magnetic field detectors are arranged along the reciprocating object at different distances from one another.

27. The position sensor device according to claim 26,
wherein the different distances are selected based on a linear function, a logarithmic function or a power function.

28. The position sensor device according to any of claims 1 to 27,
comprising a plurality of magnetically encoded regions fixed on the reciprocating object; and
comprising a plurality of magnetic field detectors.

29. The position sensor device according to claim 28,
wherein the arrangement of the plurality of magnetically encoded regions along the reciprocating object corresponds to the arrangement of the plurality of magnetic field detectors.

30. The position sensor device according to claim 29,
wherein at least a part of the plurality of magnetic field detectors are arranged displaced from an arrangement of a corresponding one of the plurality of magnetically encoded regions arranged along the reciprocating object.

31. The position sensor device according to any of claims 1 to 30,
wherein the number of the magnetically encoded regions equals the number of magnetic field detectors.

32. The position sensor device according to any of claims 1 to 30,

wherein the number of the magnetically encoded regions differs from the number of magnetic field detectors.

33. The position sensor device according to any of claims 1 to 32, wherein the reciprocating object is a push-pull-rod in a gearbox of a vehicle.

34. A position sensor array, comprising

a reciprocating object; and

a position sensor device according to any of claims 1 to 33 for determining a position of the reciprocating object.

35. The position sensor array according to claim 34, wherein the reciprocating object is a shaft.

36. The position sensor array according to claim 34 or 35, wherein the magnetically encoded region is provided along a part of the length of the reciprocating object.

37. The position sensor array according to claim 34 or 35, wherein the magnetically encoded region is provided along the entire length of the reciprocating object.

38. The position sensor array according to any of claims 34 to 36, wherein the reciprocating object is divided into a plurality of equally spaced segments, each segment comprising one magnetically encoded region, the magnetically encoded regions of the segments being arranged in an asymmetric manner.

39. The position sensor array according to any of claims 34 to 38, further comprising a control unit adapted to control the reciprocation of the reciprocating object based on the position of the reciprocating object which is provided to the control unit by the position sensor device.

40. A concrete processing apparatus, comprising

a concrete processing chamber;

a reciprocating shaft arranged in the concrete processing chamber adapted to reciprocate to mix concrete; and

a position sensor device according to any of claims 1 to 33 adapted to determine a position of the reciprocating shaft.

41. The concrete processing apparatus according to claim 40, further comprising a control unit adapted to control the reciprocation of the reciprocating shaft based on the position of the reciprocating shaft which is provided to the control unit by the position sensor device.

42. The concrete processing apparatus according to claim 40 or 41, further comprising a vehicle on which the concrete processing chamber, the reciprocating shaft and the position sensor device are mounted.

43. The concrete processing apparatus according to any of claims 40 to 42,

comprising a further reciprocating shaft arranged in the concrete processing chamber adapted to reciprocate to mix concrete;

wherein the reciprocating shaft and the further reciprocating shaft are operable in a countercyclical manner.

44. A method for determining a position of a reciprocating object,

comprising the steps of

detecting a signal by a magnetic field detector, the signal being generated by a magnetically encoded region fixed on a reciprocating object when the magnetically encoded region reciprocating with the reciprocating object passes a surrounding area of the magnetic field detector;

determining a position of a reciprocating object based on the detected signal.